

REMARKS

The Office action has been carefully considered. The Office action rejected claims 1-5, 7, 9-17, 19-33, and 35-44 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,938,723 to Hales II et al. ("Hales"). Further, the Office action rejected claims 6 and 8 under 35 U.S.C. § 103(a) as unpatentable over Hales in view of U.S. Patent No. 6,101,194 Annapareddy et al. ("Annapareddy"). Finally, the Office action rejected claims 18 and 34 under 35 U.S.C. § 103(a) as unpatentable over Hales in view of U.S. Patent No. 5,822,584 Thompson et al. ("Thompson"). Applicants respectfully disagree with the rejections.

By present amendment to the Office action, claims 1 and 21 have been amended. Applicants submit that the claims as filed were patentable over the prior art of record, and that the arguments herein are for purposes of clarifying the claims and/or for expediting allowance of the claims and not for reasons related to patentability. Reconsideration is respectfully requested.

Applicants thank the Examiner for the interview held (by telephone) on March 8, 2004. During the interview, the Examiner and applicants' attorney discussed the claims with respect to the prior art. The essence of applicants' position is incorporated in the remarks below.

Prior to discussing reasons why applicants believe that the claims in this application are clearly allowable in view of the teachings of the cited and applied references, a brief description of the present invention is presented.

The present invention is generally directed towards a software system and method that limits the interference of a background process with another process, particularly a foreground process. In one method, a background process is allowed to be executed for a brief time slice by a background task controller software component. When the task is executed, the actual performance of the background process is measured, and statistically analyzed with respect to its past performance data to determine whether the current performance is degraded relative to its past performance data, whether it is operating normally, or whether more information is needed.

Because the actual performance is dynamically measured for each execution period, the background process is able to appropriately and quickly back off from interfering with the foreground process with respect to device contention.

If the measurement indicates that the performance is degraded relative to its past performance data, the background process is likely interfering with the foreground process. In this situation, the background process may be suspended for longer and longer time intervals (is backed off) between allowed executions, until either some acceptable limit is reached, or until the performance of the background process no longer appears to be degraded, which indicates that it is likely no longer interfering with another process. If normal performance is detected, the back-off time interval may be reset to some predetermined minimum value. If normal performance is detected or more information is needed, the task will again receive authorization to perform work. The measured performance data

may be used to automatically and statistically calibrate a target performance value for determining whether the measured performance is degraded.

Note that the above description is for example and informational purposes only, and should not be used to interpret the claims, which are discussed below.

§102 Rejections

Turning to the claims, amended claim 1 recites a computer-readable medium having computer-executable instructions, comprising, executing a background task, receiving data from a software component indicative of a measured progress of the background task relative to past performance data of the background task, and determining when to again execute the background task based on the data.

The Office action rejected claim 1 as being anticipated by Hales. More specifically, the Office action contends that Hales discloses executing a background task. Column 11, lines 62-66 of Hales is referenced. Further, the Office action contends that Hales discloses receiving data from a software component indicative of a measured progress of the background task relative to past performance data. Column 11, lines 29-38 and column 12, lines 1-3 of Hales are referenced. Finally, the Office action contends that Hales discloses determining when to again execute the background task based on the data. Column 10, lines 54-67 of Hales is referenced. Applicants respectfully disagree as each and every element of claim 1 as recited is not taught or suggested by Hales.

Generally speaking, the cited and applied reference teaches throttling the execution of background tasks based upon the allotted time given for the execution of a background task relative to the allotted time given for the execution of a foreground task. More specifically, Hales teaches a background task manager (BTM) that performs a "throttling" of the time allotted by the BTM to execute background tasks. See column 11, lines 29-32. As such, if the BTM detects that activity (measured as CPU cycle time dedicated to executing background tasks) is too high, the BTM "backs-off." See column 11, lines 33-34. The term "too high" is relative and is determined by a comparison of CPU cycles required between tasks internal to the BTM and external to the BTM. As such, the BTM, using two "stopwatches," measures the CPU cycle time that the BTM is using and the CPU cycle time that the foreground tasks are using. See column 11, lines 34-36. Thus, once these CPU cycle times are known, the amount of CPU cycle time spent external to the BTM is compared to the amount of CPU cycle time spent internal to the BTM. See column 12, lines 11-14.

Using this comparison of measured CPU cycle times, one of two situations occurs. If the absolute CPU cycle time spent outside the BTM is smaller than the absolute CPU cycle time spent inside the BTM (plus an optional variable offset), the time allotted for the background task is typically throttled back. See step 812 of FIG. 8c and column 12, line 56 to column 13, line 34. However, if the absolute CPU cycle time spent outside the BTM is larger than the absolute CPU cycle time spent inside the BTM (plus an optional variable offset), the time allotted for the background task is typically not throttled back. See step 812 of FIG. 8b and

column 12, lines 19-54. The variable offset time is initially set to time spent within the BTM during a previous execution of a different background task. See column 12, lines 1-3.

As an example, a background task and a foreground task may be alternately executing. The first stopwatch may determine that 35 CPU clock cycles are spent outside the BTM and the second stopwatch may determine that 10 CPU clock cycles are being spent within the BTM. The variable offset may initially be set to zero or may be set to a number equivalent to the offset associated with the a previous known execution time for a different background task. Either way, the variable offset is set to an initial number not related to the present foreground and background tasks.

Assuming, first, that the variable offset is set to zero, then the comparison would be made at 25 cycles external to 10 cycles internal. Thus, the absolute comparison indicates that the background task is not taking too much time and no throttling occurs (*i.e.*, not delaying the background task). However, assuming second that the variable offset is set to 20, then the comparison would be made at 5 cycles external (25 cycles minus the offset) and 10 cycles internal. Then the absolute comparison indicates that the background task is taking too much time and the background task timing is adjusted (*i.e.*, delaying the background task).

Thus, Hales teaches that the CPU cycle time allotted to the background task relative to the CPU cycle time allotted to the foreground task are used to determine throttling the execution of a background task. Significantly, measurement of the CPU cycle time allotted to the execution of a task is not the same as measuring the

progress of the execution of a task. Even if one were to interpret the data collected to be indicative of a measured progress of the background task and that the measured progress is relative to past performance data (*i.e.*, the variable offset in Hales), the past performance data in Hales still references a different background task, *i.e.*, one performed during the last serving window.

In direct contrast, claim 1 recites receiving data indicative of a measured progress of the background task relative to past performance data of the background task. That is, this embodiment of the present invention uses a statistical analysis of the measured progress of the background task relative to its own past performance data. Thus, claim 1 recites at least two patentable differences over Hales. First, claim 1 recites that the data is indicative of a measured progress relative to past performance data (as opposed to counting CPU cycle time allotted to the background and foreground tasks as taught by Hales). Second, claim 1 recites that the past performance data is based on the same background task (as opposed to a previous, unrelated background task as taught by Hales).

For at least these reasons, applicants submit that claim 1, as amended, is allowable over the prior art of record.

Applicants respectfully submit that dependent claims 2-5, 7, 9-17, 19-20, and 40-41, by similar analysis, are allowable. Each of these claims depends either directly or indirectly from claim 1 and consequently includes the recitations of independent claim 1. As discussed above, Hales fails to disclose the recitations of claim 1 and therefore these claims are also allowable over the prior art of record.

In addition to the recitations of claim 1 noted above, each of these dependent claims includes additional patentable elements.

For example, claim 3 recites the computer-readable medium having computer-executable instructions of claim 1, wherein determining when to again execute the background task includes comparing the measured progress of the background task against a target progress, the target progress based on data measured from previously running the background task. That is, the statistical analysis of performance is based on a target progress that is based on a previous background task performance.

Hales, on the other hand, teaches using data from a previous performance of a background task to determine an offset that is, in turn, used for an absolute comparison of background task to foreground task performance. In other words, the measurement of the background task is not compared against the target progress, as recited in claim 3, but rather, background and foreground task performance is compared to each other.

As another example, claim 14 recites the measured progress comprises an amount of work performed per unit time. That is, the number of operations performed during an allotted time slice is used to measure the progress of the background task. In direct contrast, Hales teaches measuring the allotted time for background tasks and the allotted time for foreground tasks regardless of the work performed by either. Thus, the measured progress is not measured as amount of work performed per unit time as recited in claim 14.

For at least these reasons and in addition to being ultimately dependent on allowable claim 1, applicants submit that claims 2-5, 7, 9-17, 19-20, and 40-41 are allowable over the prior art of record.

Turning to the next independent claim, amended claim 21 recites a system for regulating the execution of a background task, comprising, a task regulator comprising software code for authorizing the background task to execute, a performance evaluator comprising software code for receiving measured performance data of the background task and evaluating the measured performance data with respect to past performance data of the background task and providing progress information corresponding thereto, and a computation mechanism comprising software code connected to receive the progress information from the performance evaluator, the task regulator connected to the computation mechanism for authorizing the background task to again execute based on information received from the computation mechanism.

The Office action rejected claim 21 as being anticipated by Hales and stated that the reasons for the rejection are similar to the reasons given for the rejection of claim 1. As such, the Office action contends that Hales discloses a task regulator comprising software code for authorizing the background task to execute. Column 11, lines 62-66 of Hales is referenced. Further, the Office action contends that Hales discloses a performance evaluator comprising software code for receiving measured performance data of the background task and evaluating the measured performance data with respect to past performance data of the background task and providing progress information corresponding thereto. Column 11, lines 29-38

and column 12, lines 1-3 of Hales are referenced. Finally, the Office action contends that Hales discloses a computation mechanism comprising software code connected to receive the progress information from the performance evaluator, the task regulator connected to the computation mechanism for authorizing the background task to again execute based on information received from the computation mechanism. Column 10, lines 54-67 of Hales is referenced. Again, applicants respectfully disagree as each and every element of claim 21 as recited is not taught or suggested by Hales.

As was discussed above with respect to claim 1, (although applicants submit that claim 21 is not identical to claim 1 and should be examined on its own merits), claim 21 similarly recites at least two patentable differences over Hales. First, claim 21 recites an evaluator for receiving measured performance data of the background task and evaluating the measured performance data with respect to past performance data of the background task (as opposed to evaluating the comparison of the allotted CPU cycle time for the background and foreground tasks as taught by Hales). Second, claim 21 recites that the past performance data is based on the same background task (as opposed to a previous, unrelated background task as taught by Hales).

Additionally, claim 21 also recites providing progress information corresponding to the evaluating of the measured performance data with respect to past performance data of the background task. That is, not only is the statistical evaluation made and used to adjust the current execution of a task, information about the execution itself is provided. In its shortcomings, Hales simply makes a

comparison of allotted times and in a clumsy "less than" or "greater than" fashion, the background task may be adjusted. At no time does the system of Hales provide information about the measured performance of the background task.

For at least these reasons, applicants submit that claim 21, as amended, is allowable over the prior art of record.

Applicants respectfully submit that dependent claims 22-31 and 42-44, by similar analysis, are allowable. Each of these claims depends either directly or indirectly from claim 21 and consequently includes the recitations of independent claim 21. As discussed above, Hales fails to disclose the recitations of claim 21 and therefore these claims are also allowable over the prior art of record. In addition to the recitations of claim 21 noted above, each of these dependent claims includes additional patentable elements.

Turning to the last independent claim, claim 32 recites a method of executing a background process, comprising the steps of, executing a task of the background process, measuring the progress of the task via software code, comparing the progress of the task against a target progress that is based on at least one previous progress measurement of the task, and if the progress of the task is degraded relative to the target progress, increasing a delay time from a previous value thereof, and suspending for the delay time before re-executing the task.

Again, the Office action rejected claim 32 as being anticipated by Hales and stated that the reasons for the rejection are similar to the reasons given for the rejection of claim 1-3. Applicants respectfully disagree.

As was discussed above with respect to claims 1 and 21, (although applicants submit that claim 32 is not identical to claims 1 and/or 21 and should be examined on its own merits), claim 32 similarly recites at least two patentable differences over Hales. First, claim 32 recites comparing the progress of the task against a target progress that is based on at least one previous progress measurement of the task (as opposed to comparing the CPU cycle time allotted for the background and foreground tasks as taught by Hales). Second, claim 32 recites that the past performance data is based on the same background task (as opposed to a previous background task as taught by Hales).

Additionally, claim 32 recites comparing the progress of the task against a target progress. That is, the statistical analysis of performance is based on a target progress that is based on a previous background task performance.

In contrast, Hales teaches using data from a previous performance of a background task to determine an offset that is, in turn, used for an absolute comparison of background task to foreground task performance. In other words, the measurement of the background task is not compared against the target progress, as recited in claim 32, but rather, background and foreground task performance are compared to each other.

For at least these reasons, applicants submit that claim 32 is allowable over the prior art of record.

With regard to claims 33 and 35-39, these claims depend either directly or indirectly from claim 32. Again, the Office action rejected these claims for similar reasons given previously with respect to claims that depend from claim 1.

Applicants submit that claims 33 and 35-39 are allowable because they include the recitations of claim 32. As discussed above, Hales fails to disclose the recitations of claim 32 and therefore these claims are also allowable over the prior art of record. In addition to the recitations of claim 32 noted above, each of these dependent claims includes additional patentable elements.

For at least these reasons, claims 1-5, 7, 9-17, 19-33, and 35-44 are patentable over the prior art of record. Reconsideration and withdrawal of the rejections in the Office action is respectfully requested.

§103 Rejections

The Office action rejected dependent claims 6 and 8 as being unpatentable over Hales in view of Annapareddy. More specifically, the Office action acknowledges that Hales does not teach setting a suspend time to a minimum value (claim 6) or increasing the suspend time includes doubling a previous suspend time (claim 8). However, the Office action concludes that Annapareddy teaches these elements and the combination of Hales and Annapareddy would render claims 6 and 8 obvious to a person skilled in the art at the time of the invention.

However, as discussed above, Hales fails to disclose the recitations of claim 1, and dependent claims 6 and 8 include each and every element of claim 1. Furthermore, Annapareddy also fails to disclose the recitations of claim 1. Nowhere in Annapareddy can there be found any disclosure of executing a background task, receiving data from a software component indicative of a

measured progress of the background task relative to past performance data of the background task, and determining when to again execute the background task based on the data. Annapareddy, instead relates to resolving conflicts between competing nodes in a communications network. Neither Hales nor Annapareddy, whether considered alone or in any permissible combination, disclose each and every element of claim 1, and therefore, do not make obvious dependent claims 6 and 8 which include each and every element of claim 1.

The Office action rejected claims 18 and 34 as being unpatentable over Hales in view of Thompson. More specifically, the Office action acknowledges that Hales does not teach recognizing duplicate files on a file system partition. However, the Office action concludes that Thompson teaches these elements and the combination of Hales and Thompson would render claims 18 and 34 obvious to a person skilled in the art at the time of the invention.

But, as discussed above, Hales fails to disclose the recitations of claims 21 and 32. Dependent claim 18 includes each and every element of claim 21 and dependent claim 34 includes each and every element of claim 32. Furthermore, Thompson also fails to disclose the recitations of claims 21 and 32. Nowhere in Thompson can there be found any disclosure of a system for regulating the execution of a background task, comprising, a task regulator comprising software code for authorizing the background task to execute, and a performance evaluator comprising software code for receiving measured performance data of the background task, as recited in claim 21. Nor can there be found anywhere in Thompson disclosure of a method of executing a background process, comprising

the steps of, executing a task of the background process, measuring the progress of the task via software code, and comparing the progress of the task against a target progress that is based on at least one previous progress measurement of the task, as recited in claim 32. Thompson instead relates to rebuilding a replacement disk of a fault tolerant mass storage device array. Neither Hales nor Thompson, whether considered alone or in any permissible combination, disclose each and every element of claim 21 or 32, and therefore, do not make obvious dependent claims 18 and 34, respectively.

For at least these reasons, applicants submit that all the claims are patentable over the prior art of record. Reconsideration and withdrawal of the rejections in the Office action is respectfully requested and early allowance of this application is earnestly solicited.

CONCLUSION

In view of the foregoing remarks, it is respectfully submitted that claims 1-44 are patentable over the prior art of record, and that the application is good and proper form for allowance. A favorable action on the part of the Examiner is earnestly solicited.

If in the opinion of the Examiner a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney at (425) 836-3030.

Respectfully submitted,



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In re Application of DOUCEUR et al.
Serial No. 09/354,970

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Albert S. Michalik

1610 Amendment